Stoller
Grand Junction Office established 1959

299-E13-15 (A5860)
Log Data Report

Borehole Information:

Borehole: 299-E13-15 (A5860)			**Site:** 216-B-31 Trench		
Coordinates (WA State Plane)		**GWL (ft)[1]:** 339.65		**GWL Date:** 6/13/03	
North	**East**	**Drill Date**	**TOC[2] Elevation**	**Total Depth (ft)**	**Type**
134,346.35 m	572,990.43 m	Jan. 1957	225.841 m	367	Cable Tool

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Welded steel	1.3	6 1/2	6	1/4	+1.3	100
Threaded steel	1.0	8 5/8	8	5/16	+1.0	366
The logging engineer measured the 6-in. and 8-in. outside casing diameters with a caliper. Inside diameter for the 6-in. casing and the caliper measurements were determined using a steel tape. Measurements were rounded to the nearest 1/16 in. Casing thickness was calculated. Inside diameter and casing thickness for the 8-in. casing were estimated. Casing depths are from Ledgerwood (1993). Casing stick-up was measured using a steel tape.						

Borehole Notes:

Borehole coordinates, elevation, and well construction information are derived from measurements by Stoller field personnel, HWIS[3], Ledgerwood (1993), and Chamness and Merz (1993). Zero reference is the top of the 6-in. casing. The logging engineer measured depth-to-water and is reported above.

Logging Equipment Information:

Logging System:	Gamma 2E		**Type:** SGLS (70%), SN 34TP40587A
Calibration Date:	3/2003	**Calibration Reference:**	GJO-2003-430-TAC
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2	3	4/Repeat	5
Date	6/13/03	6/16/03	6/17/03	6/18/03	6/18/03
Logging Engineer	Spatz	Spatz	Spatz	Spatz	Spatz
Start Depth (ft)	100.0	12.0	339.0	166.0	134.0
Finish Depth (ft)	11.0	2.0	133.0	132.0	99.0
Count Time (sec)	200	200	100	100	100
Live/Real	R	R	R	R	R
Shield (Y/N)	N	N	N	N	N
MSA Interval (ft)	1.0	1.0	1.0	1.0	1.0
ft/min	N/A[4]	N/A	N/A	N/A	N/A
Pre-Verification	BE040CAB	BE041CAB	BE042CAB	BE043CAB	BE043CAB

Log Run	1	2	3	4/Repeat	5
Start File	BE040000	BE041000	BE042000	BE043000	BE043032
Finish File	BE040089	BE041010	BE042206	BE043034	BE043067
Post-Verification	BE040CAA	BE041CAA	BE042CAA	BE043CAA	BE043CAA
Depth Return Error (in.)	0	0	+1.5”	N/A	0
Comments	No fine-gain adjustment.	No fine-gain adjustment.	Fine-gain adjustment made after files -081, -087, -117, -163, and -190.	Repeat section.	No fine-gain adjustment.

Logging Operation Notes:

Zero reference was top of the 6-in. casing. Above 100 ft (runs 1 and 2), a centralizer was installed on the sonde. A centralizer was not used below 100 ft because of the risk of hang-up when the sonde enters the 6-in. casing. Pre- and post-survey verification measurements for the SGLS employed the Amersham KUT (^{40}K, ^{238}U, and ^{232}Th) verifier with serial number 082. During SGLS logging, fine-gain adjustments were needed in run 3 (see above).

Analysis Notes:

Analyst:	Sobczyk	Date:	07/07/03	Reference:	GJO-HGLP 1.6.3, Rev. 0

SGLS pre-run and post-run verification spectra were collected at the beginning and end of each day. All of the verification spectra were within the control limits except for spectrum BE042CAB. Pre-run verification spectrum BE042CAB was below the lower control limit for the 2615-keV full-width at half-maximum value. The full-width at half-maximum value describes peak shape, and a narrow peak implies better resolution. The peak counts per second (cps) at the 609-keV, 1461-keV, and 2615-keV photopeaks on the post-run verification spectra as compared to the pre-run verification spectra for each day were between 4 percent lower and 5 percent higher at the end of the day. Examinations of spectra indicate that the detector functioned normally during all of the logging runs, and the spectra are accepted.

Log spectra for the SGLS were processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. The verification spectra were used to determine the energy and resolution calibration for processing the SGLS data using APTEC SUPERVISOR. Concentrations were calculated in EXCEL (source file: G2EMar03.xls), using parameters determined from analysis of recent calibration data. Zero reference was the top of the 6-in. casing. On the basis of Ledgerwood (1993) and the total gamma response, the casing configuration was assumed to be a string of 8-in. casing to the maximum depth of the logging (339 ft) and a string of 6-in. casing to 100 ft. Casing correction factors were calculated assuming a total casing thickness of 0.563 in. from 0 to 100 ft and 0.313 in. from 100 to 339 ft. These are the measured values for these casing materials. Where more than one casing exists at a depth, the casing correction is additive (e.g., 0.25 + 0.313 = 0.563 would be the combined thickness for the 6-in. and 8-in. casings). Water and dead time corrections were not required.

Log Plot Notes:

Separate log plots are provided for gross gamma and dead time, naturally occurring radionuclides (^{40}K, ^{238}U, and ^{232}Th), and man-made radionuclides. Plots of the repeat logs versus the original logs are included. For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, or casing correction. These errors are discussed in the calibration report. A combination

plot is also included to facilitate correlation. The ^{214}Bi peak at 609 keV was used to determine the naturally occurring ^{238}U concentrations on the combination plot rather than the ^{214}Bi peak at 1764 keV because it exhibited slightly higher net counts per second.

Results and Interpretations:

^{137}Cs and ^{60}Co were the man-made radionuclides detected in this borehole. ^{137}Cs was detected near the MDL (0.2 pCi/g) at 5 ft, 69 ft, 244 ft, 252 ft, 263 ft, and 338 ft. ^{60}Co was detected in the intervals from 43 to 45 ft and 70 to 93 ft. The range of concentrations was from the MDL (0.1 pCi/g) to 0.5 pCi/g, which was measured at 78 ft.

Recognizable changes in the KUT logs occurred in this borehole. The increase in ^{40}K and ^{232}Th at 95 ft corresponds with the depth of the surface seal (Ledgerwood 1993). A decrease of 4 pCi/g in apparent ^{40}K concentrations occurs in the interval from 207 through 249 ft. Coarser grained sediments were reported on the driller's log (Ledgerwood 1993) from 205 through 240 ft. Ledgerwood (1993) reported silt and clay from 322 to 333 ft, which corresponds with a 0.3-pCi/g increase in ^{232}Th concentrations in the interval from 326 to 332 ft.

The plots of the repeat logs demonstrate reasonable repeatability of the SGLS data for the natural radionuclides (609, 1461, 1764, and 2614 keV).

Gross gamma logs (attached) from Additon et al. (1977) indicate that the sediments surrounding this borehole contained significant amounts of man-made gamma radiation from 1968 through at least 1976. The logs from 5/27/59 and 5/13/63 appear to detect background levels of gamma radiation. The logs from 4/23/68 and 5/3/76 appear to detect relatively high gamma activity in the interval from 66 ft (20 m) to 78 ft (24 m). The SGLS detected ^{60}Co from 70 through 93 ft.

References:

Additon, M.K., K.R. Fecht, T.L. Jones, and G.V. Last, 1978. *Scintillation Probe Profiles From 200 East Area Crib Monitoring Well*s, RHO-LD-28, Rockwell Hanford Operations, Richland, Washington.

Ledgerwood, R.K., 1993. *Summaries of Well Construction Data and Field Observations for Existing 200-East Resource Protection Wells*, WHC-SD-ER-TI-007, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

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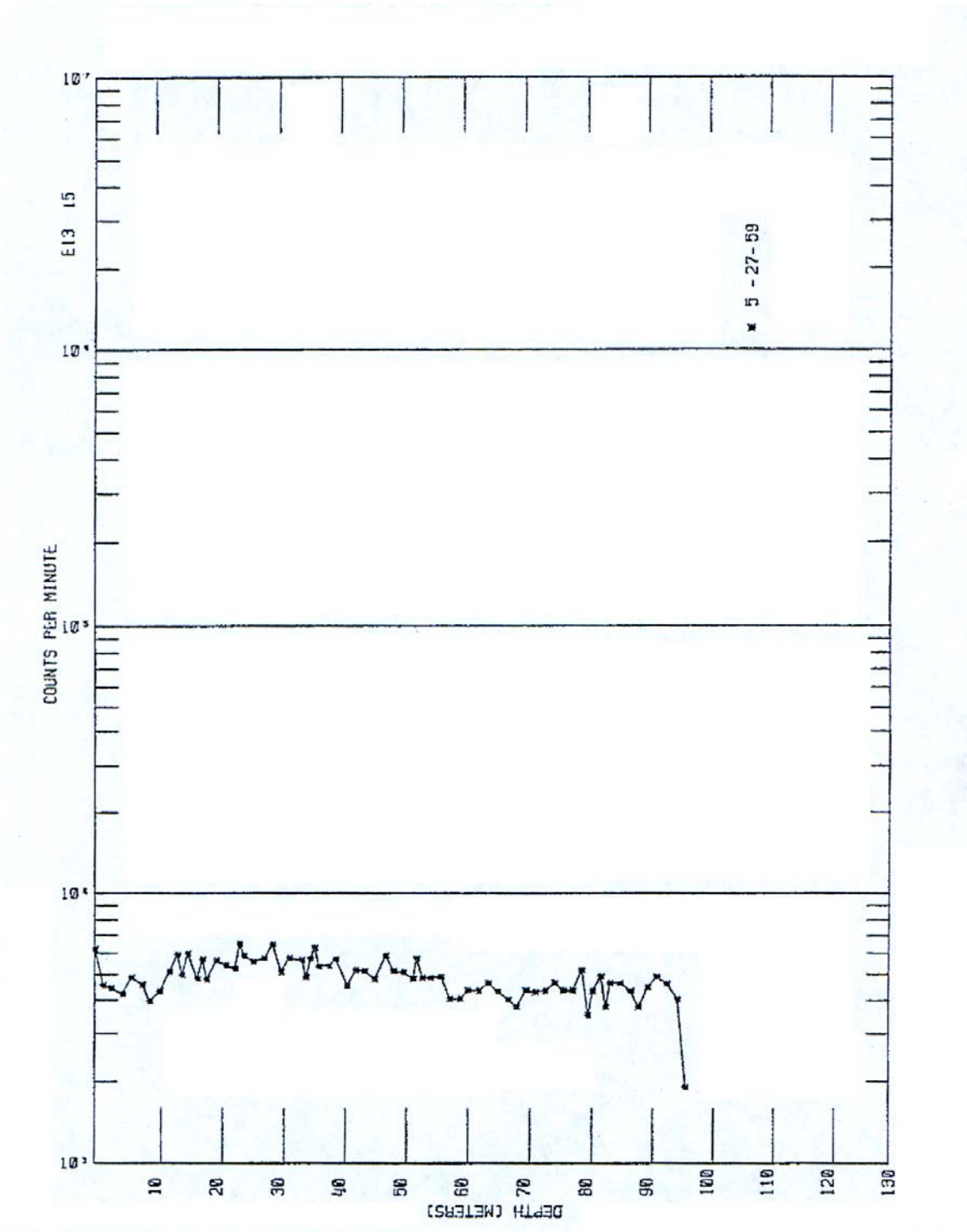
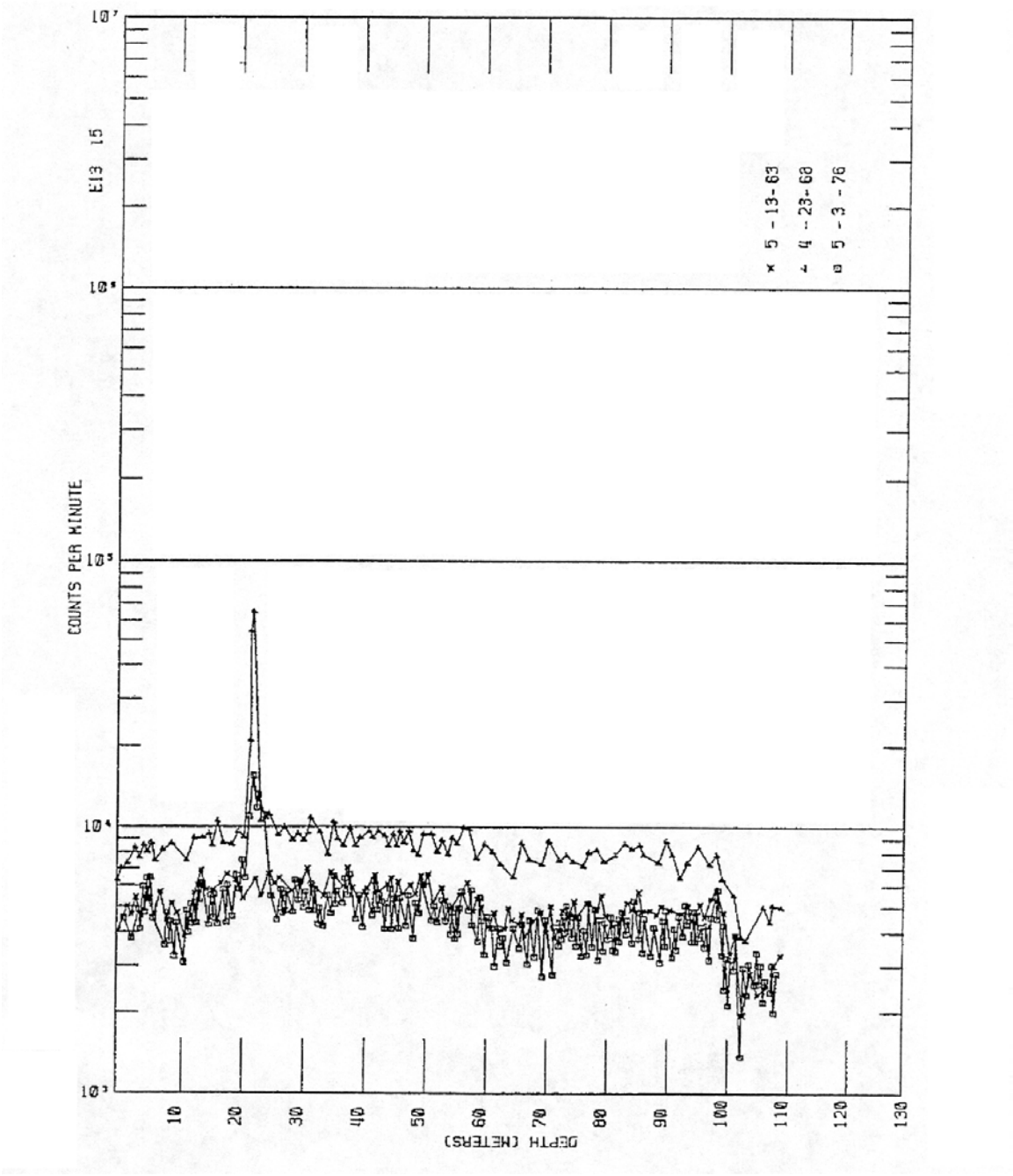
[1] GWL – groundwater level
[2] TOC – top of casing
[3] HWIS – Hanford Well Information System
[4] N/A – not applicable



from Additon et al. (1978)

Scintillation Probe Profiles for Borehole 299-E13-15, Logged on 5/27/59

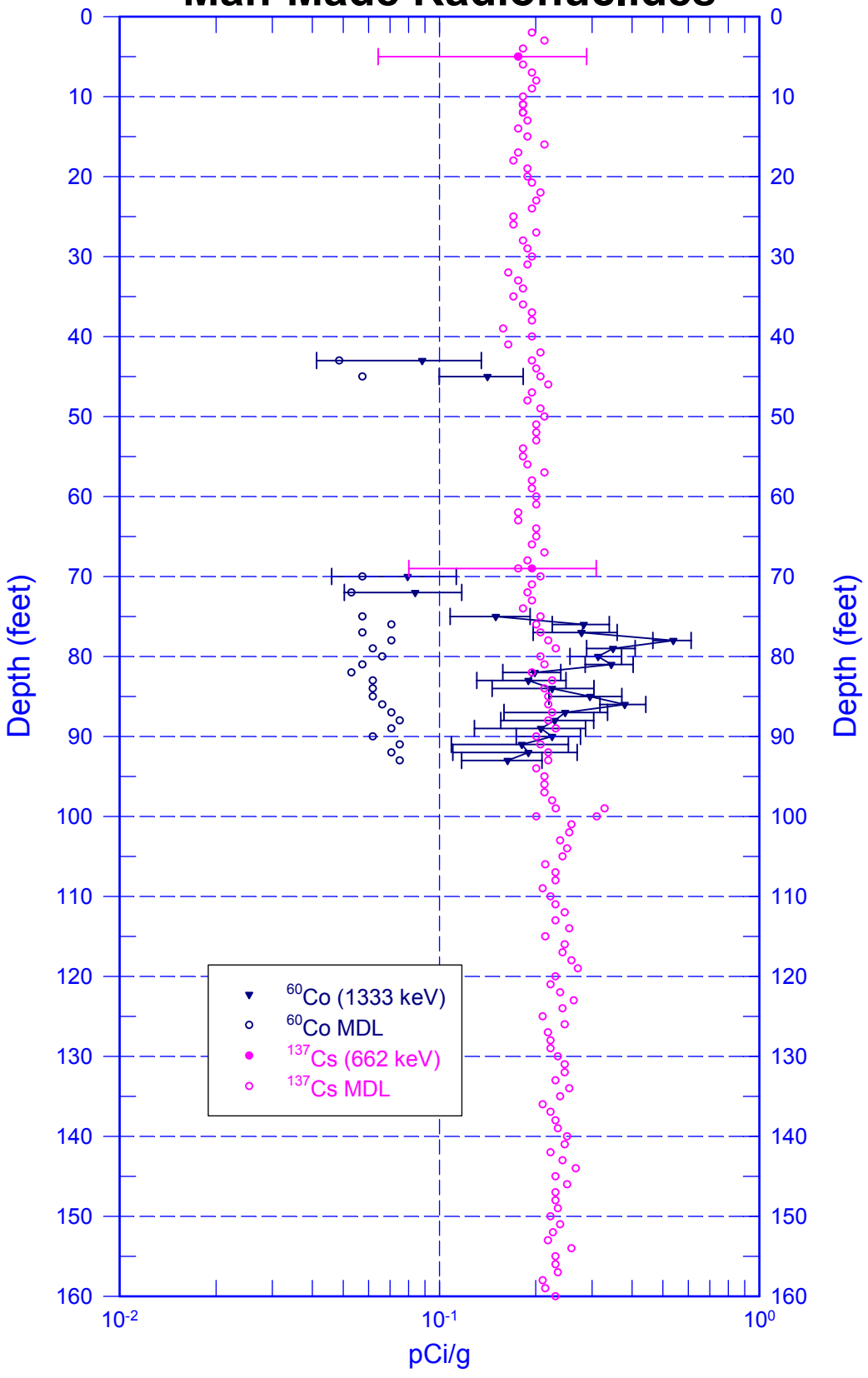


from Additon et al. (1978)

Scintillation Probe Profiles for Borehole 299-E13-15, Logged on 5/13/63, 4/23/68, and 5/3/76

299-E13-15 (A5860)

Man-Made Radionuclides

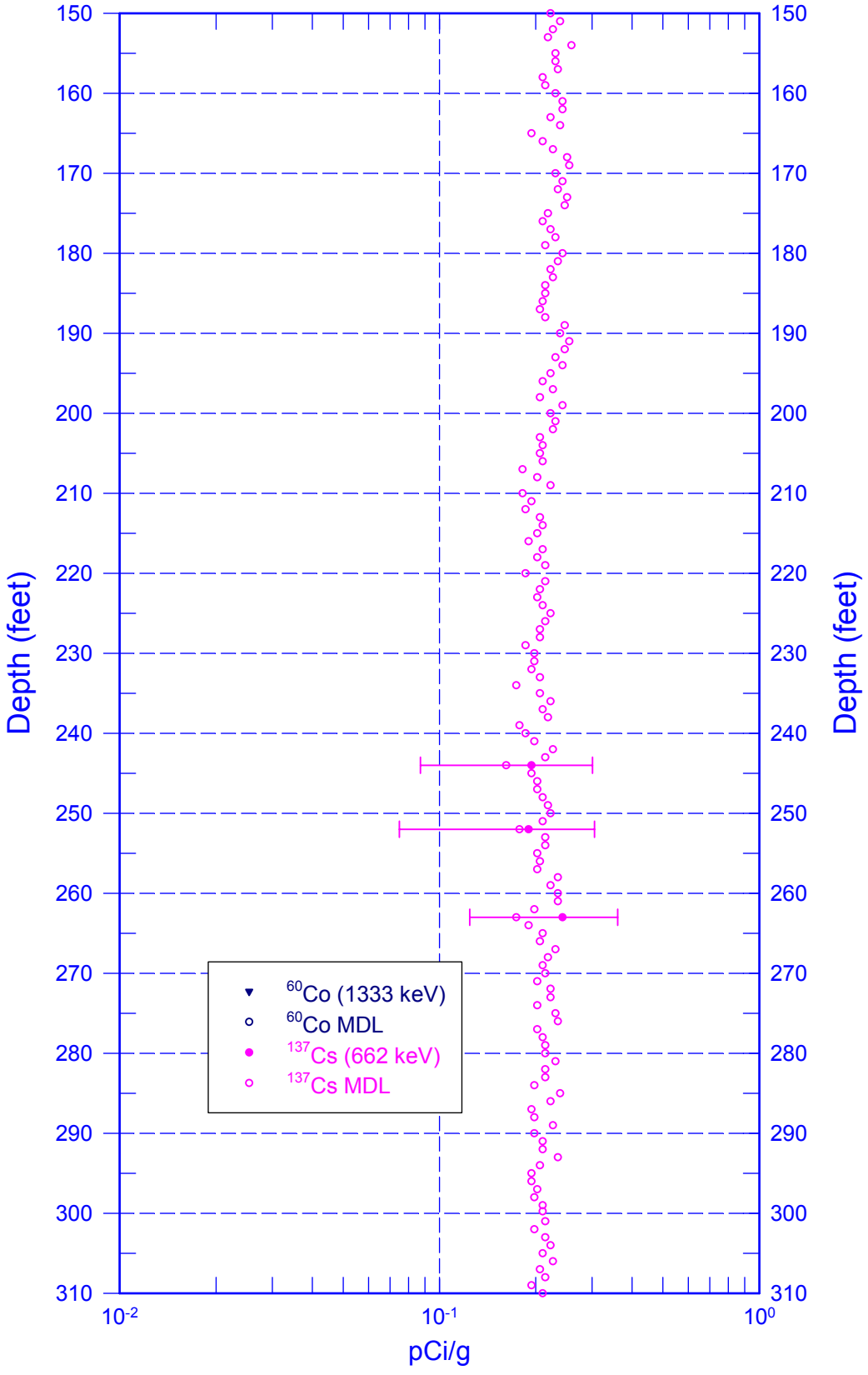


Zero Reference = Top of Casing

Date of Last Logging Run
6/18/2003

299-E13-15 (A5860)

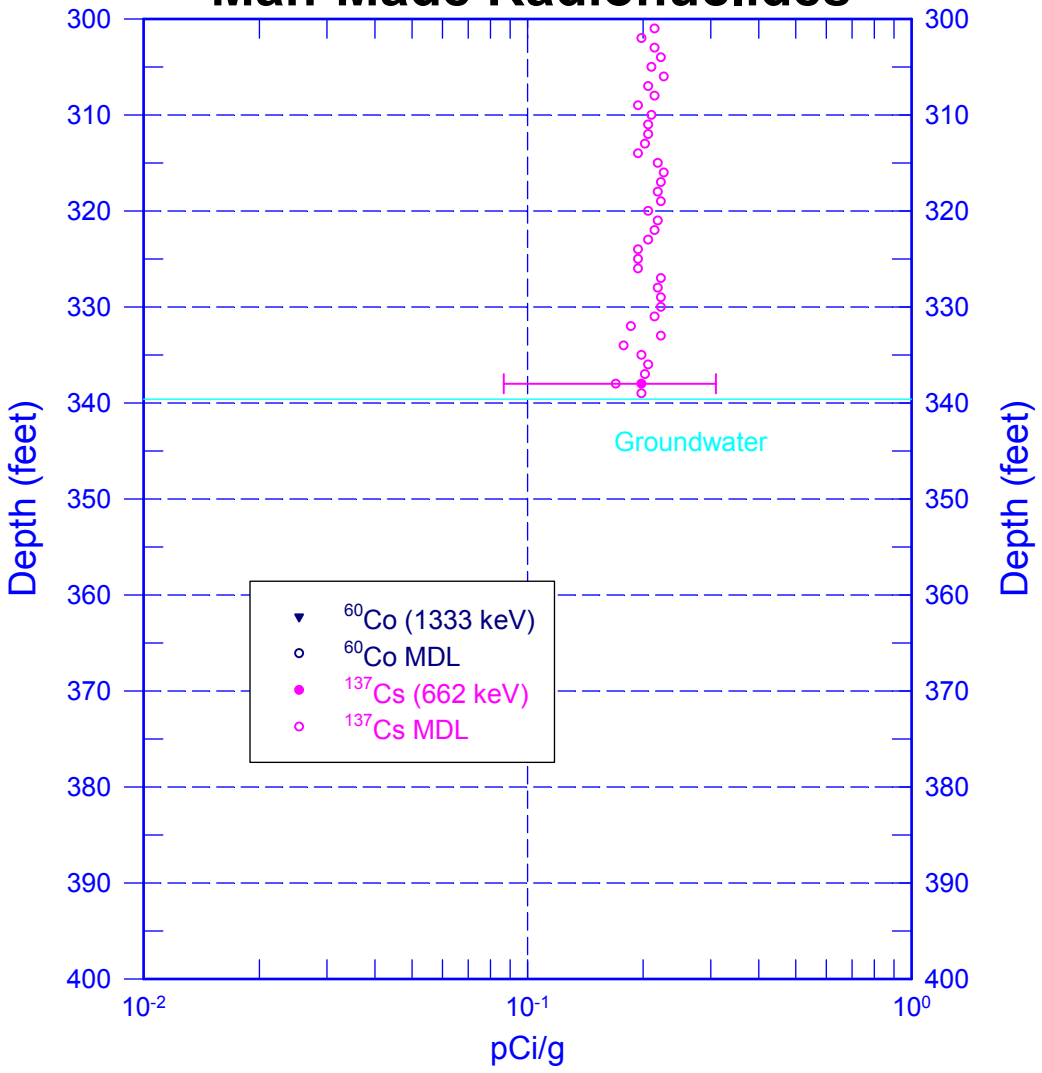
Man-Made Radionuclides



Zero Reference = Top of Casing

Date of Last Logging Run
6/18/2003

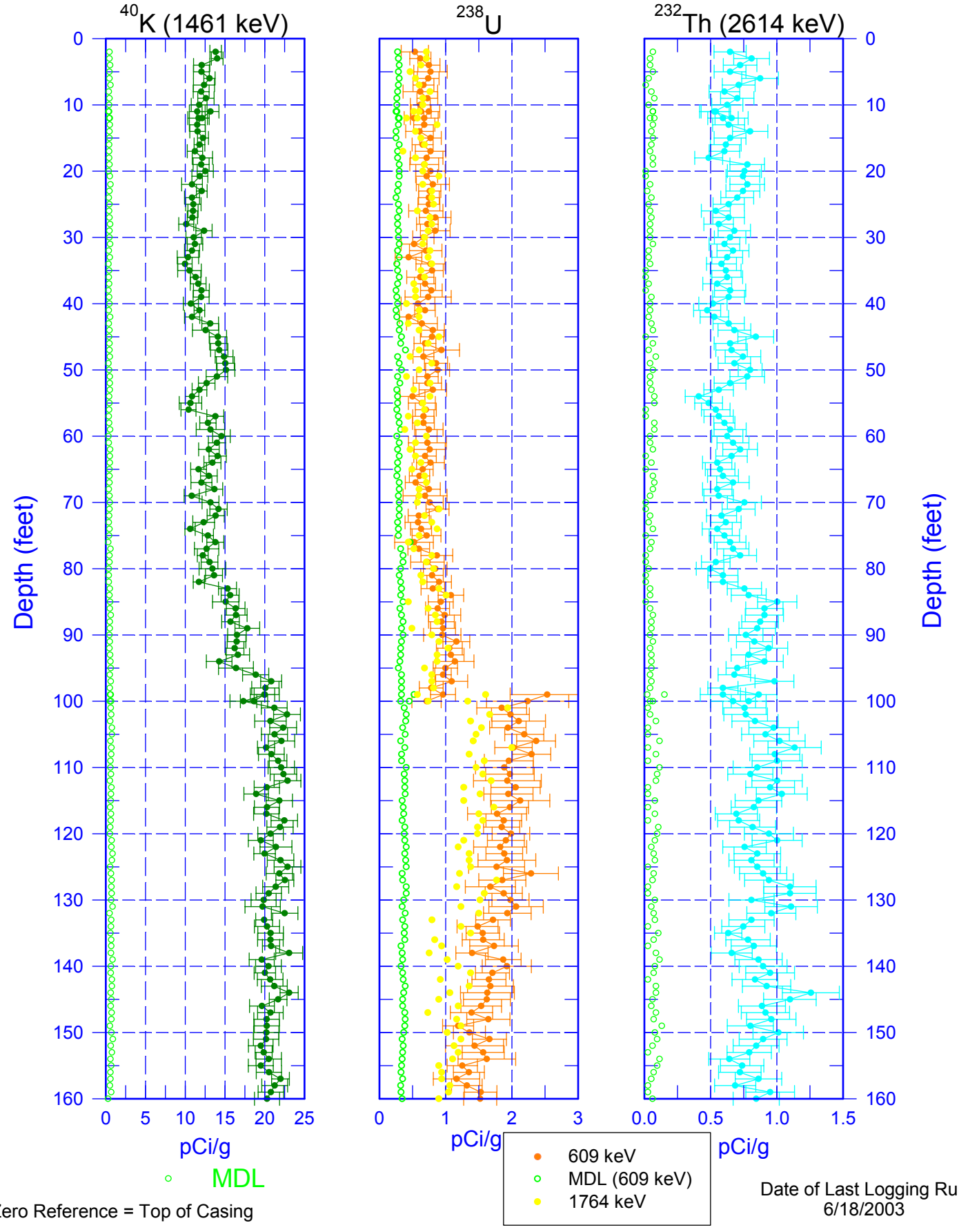
299-E13-15 (A5860)
Man-Made Radionuclides



Zero Reference = Top of Casing

Date of Last Logging Run
6/18/2003

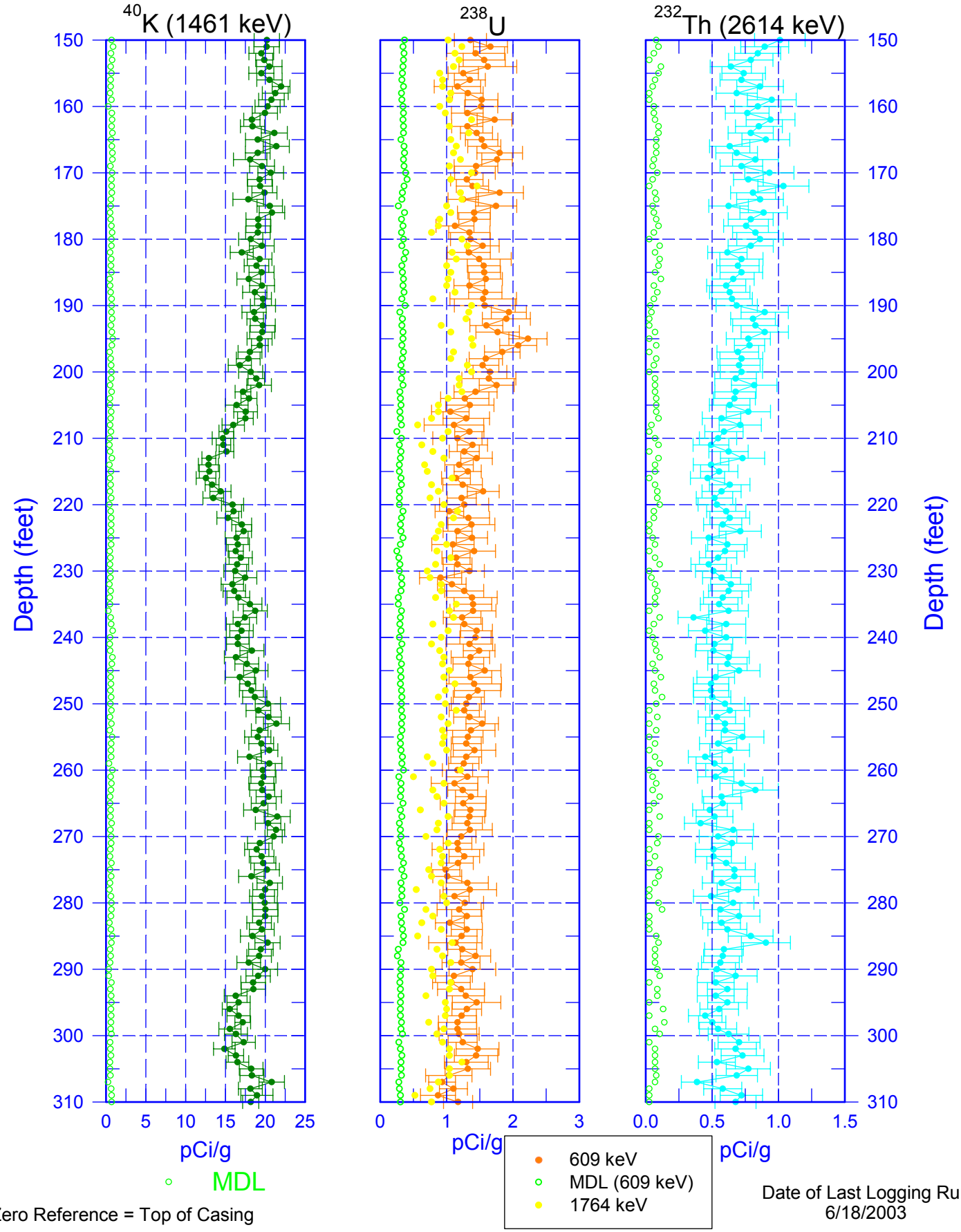
299-E13-15 (A5860)
Natural Gamma Logs



Zero Reference = Top of Casing

Date of Last Logging Run
6/18/2003

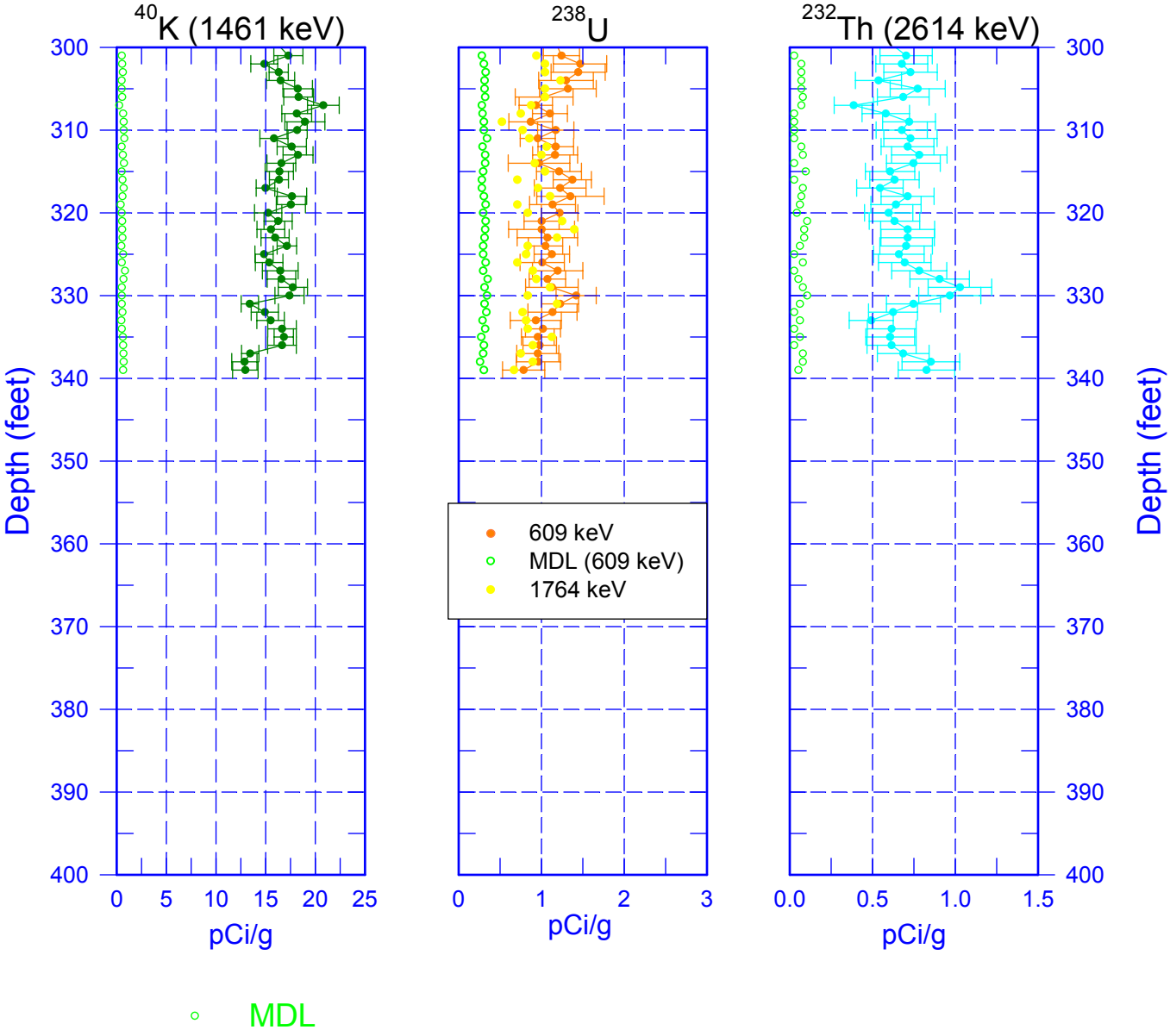
299-E13-15 (A5860)
Natural Gamma Logs



Zero Reference = Top of Casing

Date of Last Logging Run
6/18/2003

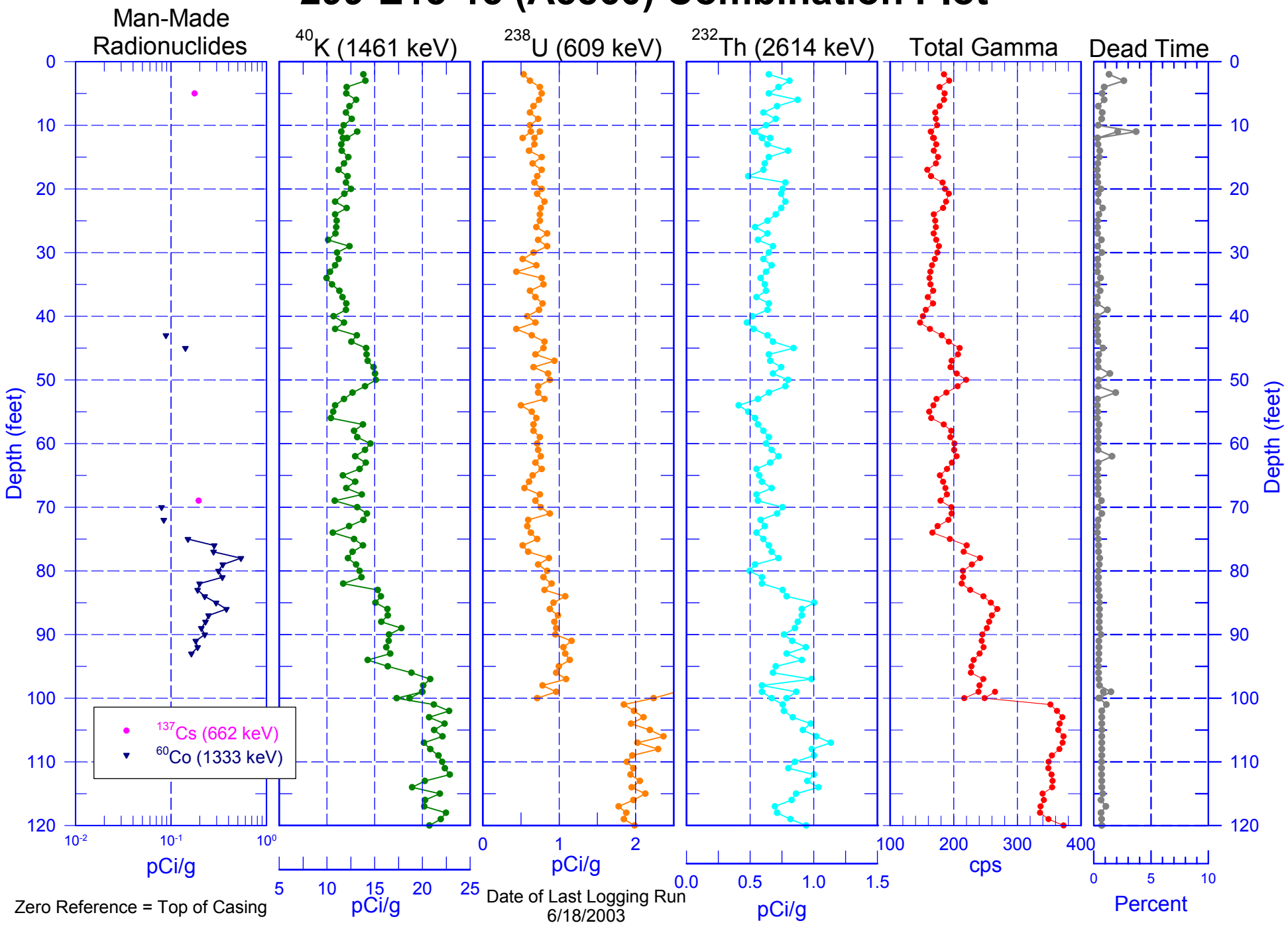
299-E13-15 (A5860)
Natural Gamma Logs



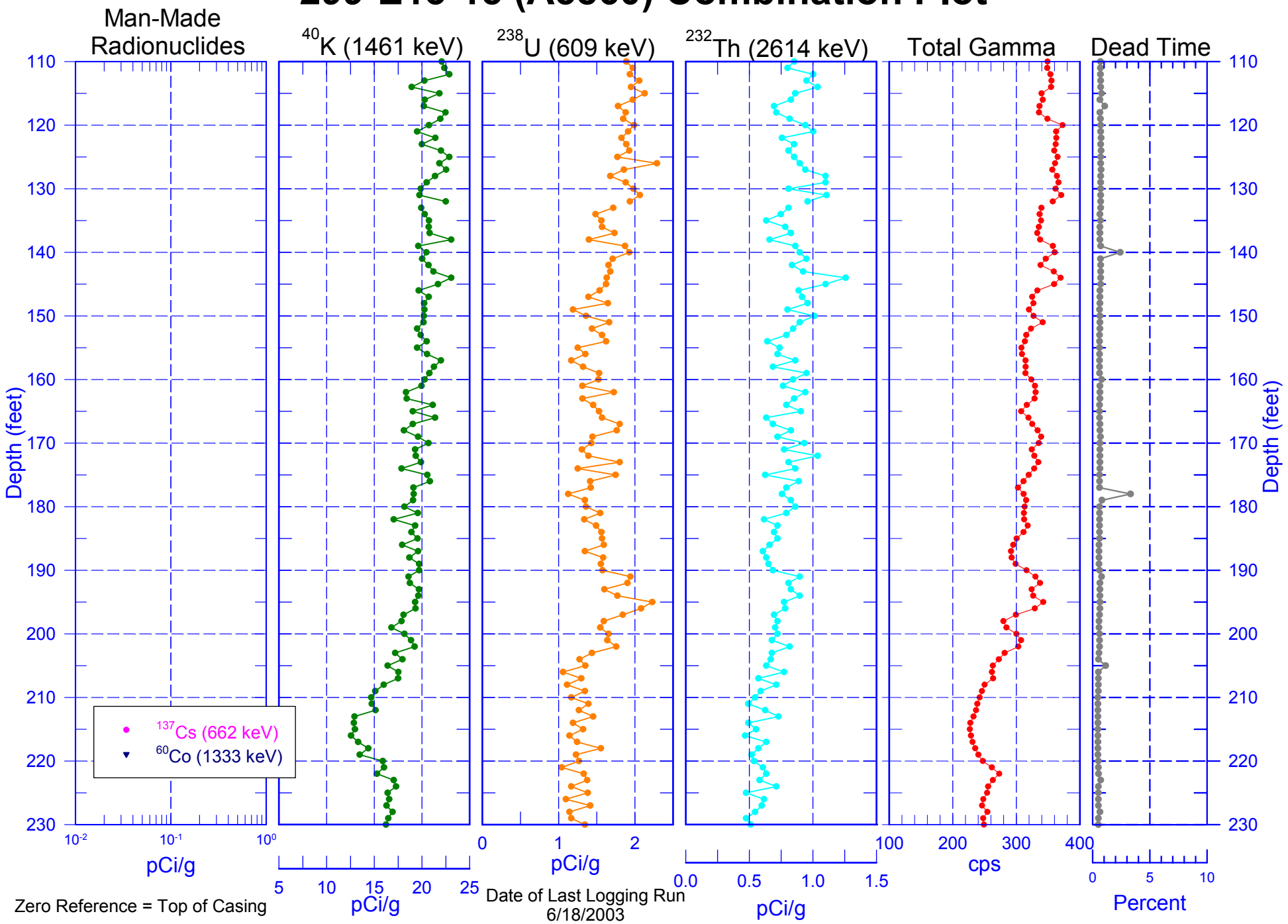
Zero Reference = Top of Casing

Date of Last Logging Run
6/18/2003

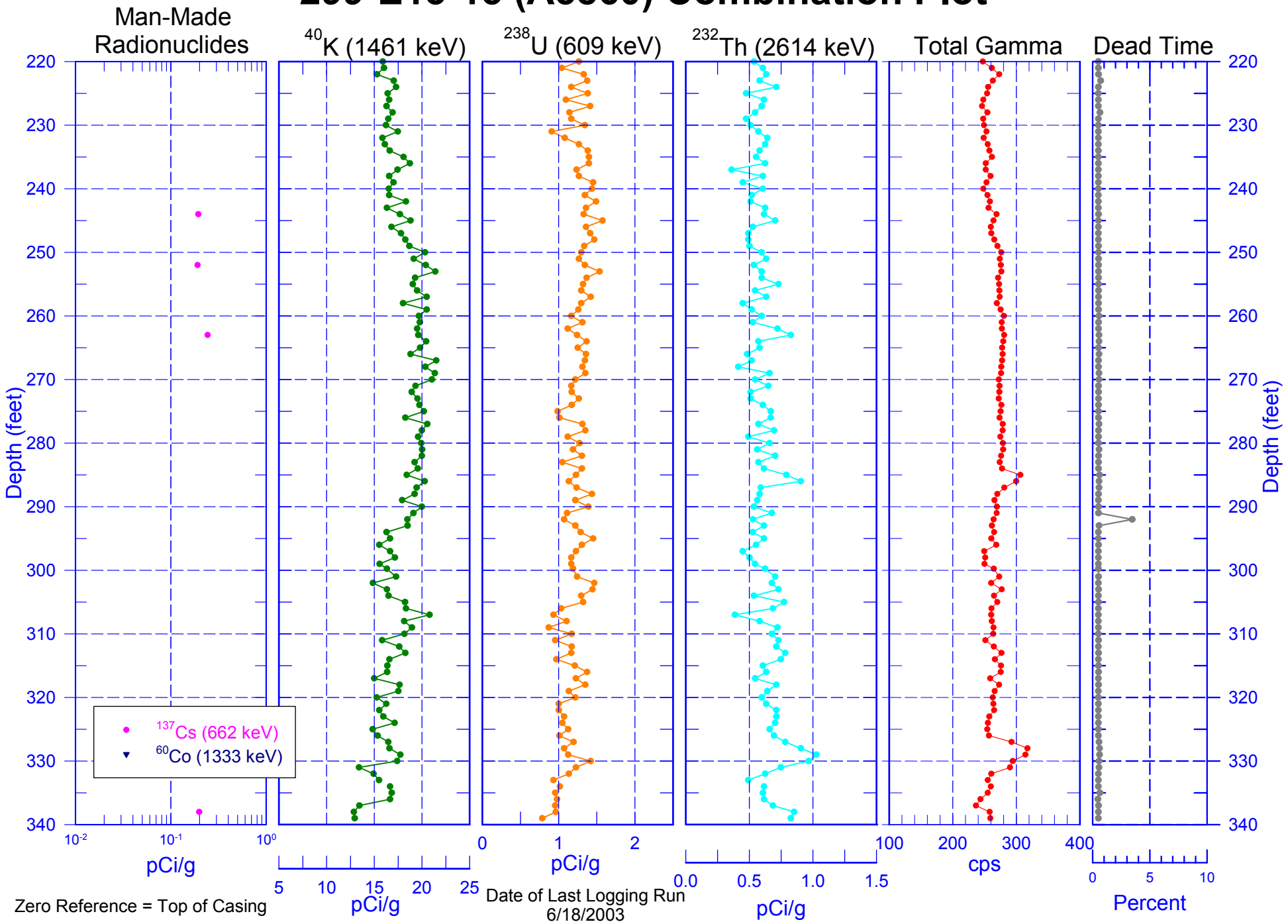
299-E13-15 (A5860) Combination Plot



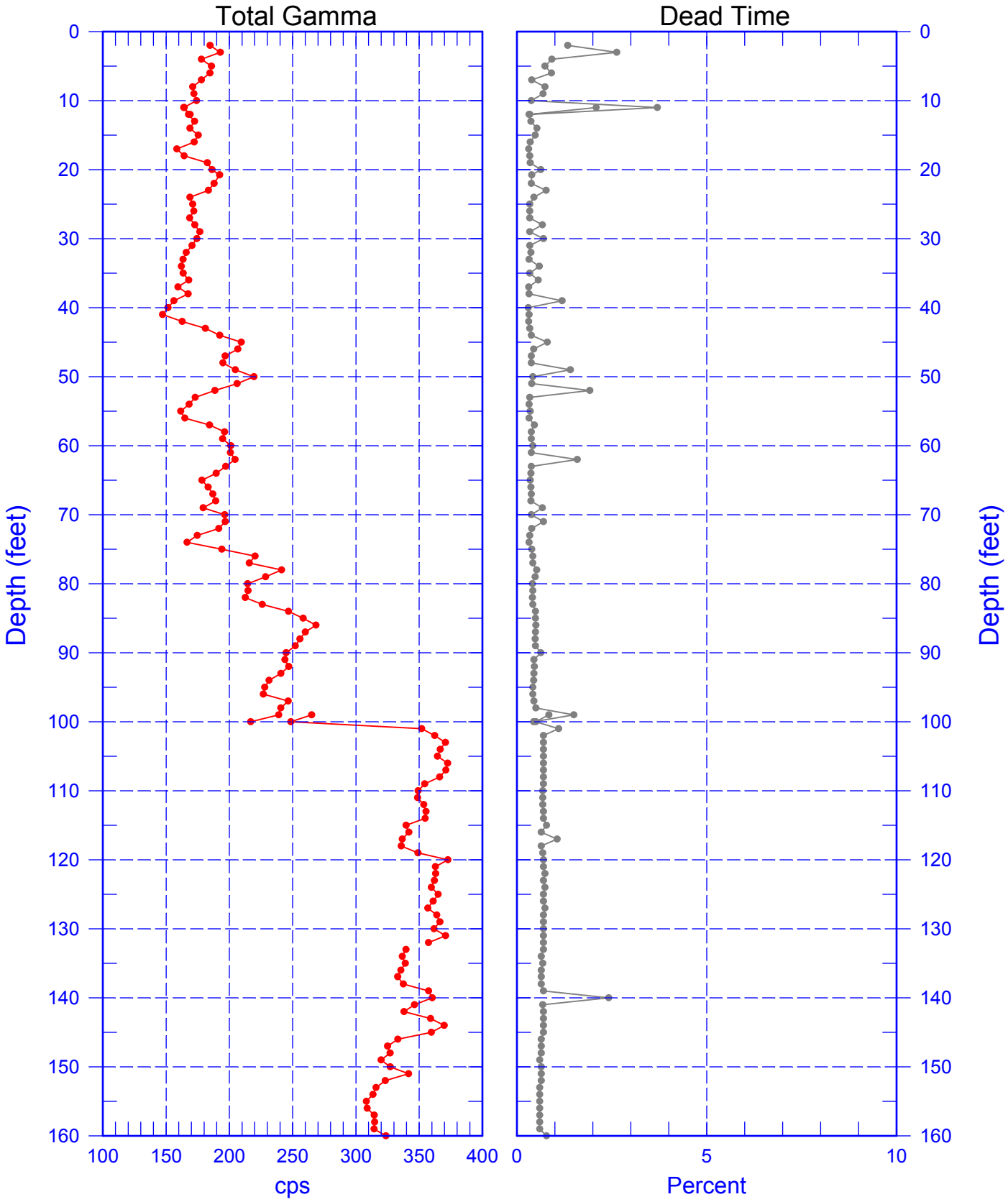
299-E13-15 (A5860) Combination Plot



299-E13-15 (A5860) Combination Plot



299-E13-15 (A5860)
Total Gamma & Dead Time



Zero Reference = Top of Casing
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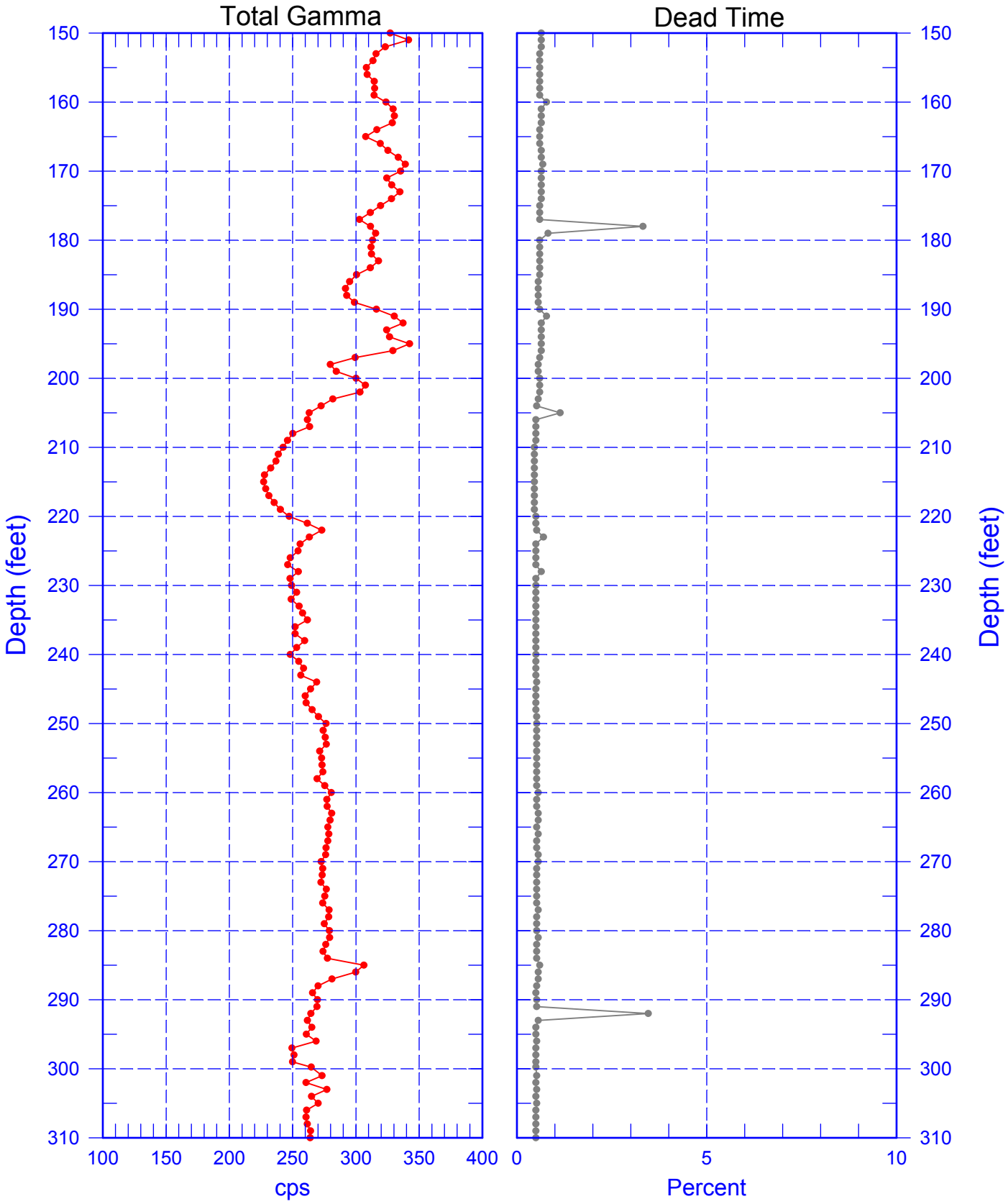
299-E13-15 (A5860)
Total Gamma & Dead Time



Zero Reference = Top of Casing
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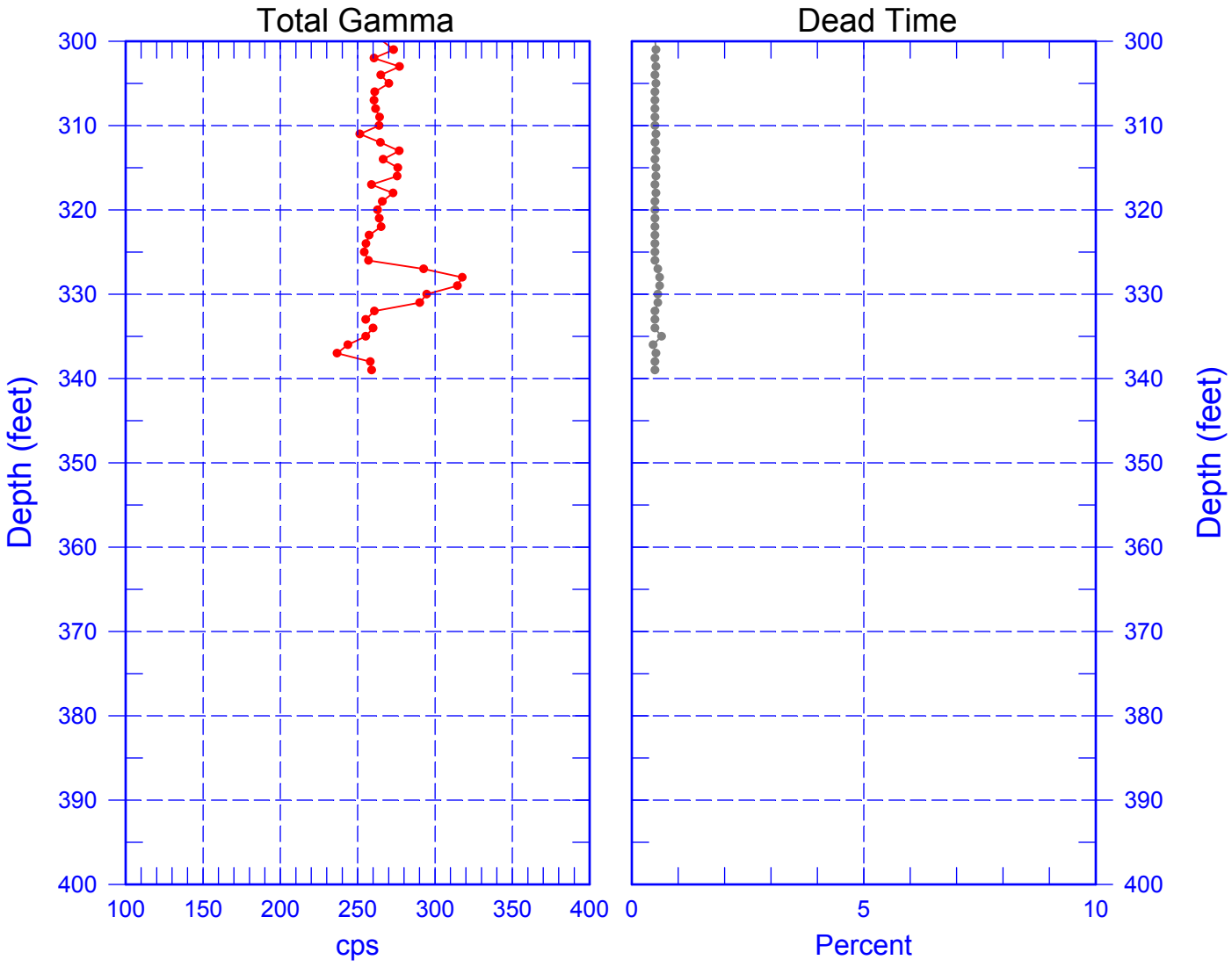
299-E13-15 (A5860)

Total Gamma & Dead Time



Zero Reference = Top of Casing

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299-E13-15 (A5860)

Rerun of Natural Gamma Logs (166.0 to 133.0 ft)